PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Assistant Commissioner for Patents
United States Patent and Trademark Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 06 June 2000 (06.06.00)	
International application No. PCT/GB99/03277	**Applicant's or agent's file reference** PFC 1432 PCT
International filing date (day/month/year) 04 October 1999 (04.10.99)	**Priority date** (day/month/year) 16 October 1998 (16.10.98)
Applicant FONGALLAND, Dharshini, Chryshantha et al	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

11 May 2000 (11.05.00)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer S. Mafla
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

Form PCT/IB/331 (July 1992)

GB9903277

09/807655

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
PFC 1432 PCT		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/GB99/03277	04/10/1999	16/10/1998
International Patent Classification (IPC) or national classification and IPC H01M8/02		
Applicant JOHNSON MATTHEY PUBLIC LIMITED COMPANY et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
11/05/2000	20.10.2000
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Mizera, E Telephone No. +49 89 2399 8580

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB99/03277

I. Basis of the r port

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-12	as originally filed			
13,14	as received on	01/09/2000	with letter of	29/08/2000

Claims, No.:

1-20	as originally filed

2. The amendments have resulted in the cancellation of:

☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	
	No:	Claims	1-19
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-20
Industrial applicability (IA)	Yes:	Claims	1-20
	No:	Claims	

2. Citations and explanations

see separate sheet

AS TO BOX V:

1. The following documents are cited:

   D1: US-A-5 547 550 (MAGNE JEAN-CLAUDE ET AL) 20 August 1996 (1996-08-20)
   D2: US-A-5 584 977 (BACHOT JEAN ET AL) 17 December 1996 (1996-12-17)
   D3: US-A-4 775 551 (BACHOT JEAN ET AL) 4 October 1988 (1988-10-04)

2. Each of documents D1-D3 fully anticipates the teaching of independent claims 1 and 13. D1 discloses a diaphragm comprising asbestos fibers, silica-based derivatives and fluorinated polymer (see claim 1). On col.5, l.32 and 33 it is disclosed that silica based derivatives comprise precipitated silica and combustion or pyrogenised silica. In l.52-58 of this column it is mentioned that the silica-based derivatives can be eliminated, but the preferred way is to perform the dissolution 'in situ', so that the silica-containing diaphragm exists as the final product, the properties of which are to be compared with those defined in claim 1. Clearly this product is suitable for the preparation of a composite membrane, e.g. by applying further membrane material onto it. It is also irrelevant, whether silica is seen as a binder or a porogen. As long as the diaphragm contains silica, the same materials are expected to exhibit the same properties. Moreover the matrix of fibers to be bound is very similar. In the application (but not in the independent claims!) the binder serves to bind glass fibers or amorphous silica, whereas in D1 asbestos fibers are bound, which behave chemically very similar.

3. Consequently claims 1, 13 and claims 2-12 and 14, depending thereon, lack novelty and inventive step under Art.33(2) and (3) PCT over D1.

4. With respect to D2 reference is made to claim 1 and Examples 9-13. Also microporous conductive material can be suitable for substrates that are suitable for membranes. The type of membranes is not defined in claim 1.

5. As to D3, reference is made to col.1, l.11-14, l.49-51, col.2, l.17-59 and Example 1. It is not relevant for a novelty discussion that the silica can be removed at a later stage.

6. With respect to process claims 15-18 reference is made to the already cited passages of D1-D3. Also the membrane electrode of claim 19 is comprised by this prior art (see e.g. D2, col.6, l.14, 15).

7. Further the application does not seem to contain anything that could support the required inventive step in connection with the use of the claimed substrate in a fuel cell, as expressed in claim 20. The advantages obtained with such substrates (e.g. better dimension stability) are not limited to the use of such substrates in electrolysis cells (see e.g. D3, col.1, l.11-14, where the use for electrolysis purposes is only given as an example).

EXAMPLE 4: PREPARATION OF TRIPLE LAMINATE MEMBRANES USING SUBSTRATE OF EXAMPLE 1

The non-woven mixed glass fibre/mixed binder matrix prepared according to Example 1 was placed on a sheet of sintered PTFE and a solution of perfluorosulphonic acid (Nafion produced by E I DuPont de Nemours) in the aqueous form as described in EP 731 520 was applied to the fibre matrix. The structure was filled with the aqueous Nafion® to achieve a total solid Nafion® loading of 7.05mg/cm^2.

A further two sheets were prepared in the same fashion. The three sheets were placed on top of each other and sandwiched between two thin, non-porous PTFE sheets. The sandwich was pressed at 90 to 100psig (710-780kPa) for six minutes at 177°C to produce a triple laminate membrane.

A 10x10cm square was cut from the bulk membrane and treated by the same procedure as described in the Comparative Examples. The results are recorded in Table 1.

EXAMPLE 5: PREPARATION OF TRIPLE LAMINATE MEMBRANES USING SUBSTRATE OF EXAMPLE 2

The non-woven silica fibre/binder matrix prepared according to Example 2 was treated according to the method and materials of Example 4 (total solid Nafion® loading of 7.24mg/cm^2) to produce a triple laminate membrane, whose results also appear in Table 1.

EXAMPLE 6: PREPARATION OF SINGLE SHEET MEMBRANES USING SUBSTRATE OF EXAMPLE 1

A single sheet of the non-woven mixed silica fibre matrix with the sprayed alcoholic Nafion® binder was formed as described in Example 1 and filled with a solution of perfluorosulphonic acid (Nafion® produced by E I DuPont de Nemours) in the aqueous form as described in EP 731 520 to achieve a total solid Nafion® loading of 7.24mg/cm^2.

The sheet was sandwiched between two thin, non-porous PTFE sheets. The sandwich was pressed at 90 to 100psig (710-780kPa) for six minutes at 177°C to produce a membrane.

A 10x10cm square was cut from the bulk membrane and treated by the same procedure as described in the Comparative Examples. The results are recorded in Table 1.

EXAMPLE 7: PREPARATION OF SINGLE SHEET MEMBRANES USING SUBSTRATE OF EXAMPLE 2

The non-woven silica fibre/binder matrix prepared according to Example 2 was treated according to the method and materials of Example 6 (total solid Nafion® loading of 7.04mg/cm^2) to produce a membrane whose results also appear in Table 1.

TABLE 1

MIXED BINDER ON FIBRE NETWORKS

Example		Fibre type	Binder Type	Dimensional Changes		
				x (%)	y (%)	z (%)
CP	Nafion® 1135	N/A	N/A	+4.1	+25.0	+30.0
CP	Nafion® 115	N/A	N/A	+15.8	+20.5	+39.0
CP	Nafion® 117	N/A	N/A	+13.4	+22.5	+39.0
4	triple laminate	mixed glass fibres	1:1 colloidal silica/PTFE	+8.0	+7.0	+16.0
5	single sheet	mixed glass fibres	1:1 colloidal silica/PTFE	+2.5	+3.0	+5.6
6	triple laminate	quartz microfine fibre	1:1 colloidal silica/PTFE	+6.0	+4.0	+10.0
7	single sheet	quartz microfine fibre	1:1 colloidal silica/PTFE	0.0	0.0	0.0

CLAIMS

EXAMPLE 4: PREPARATION OF TRIPLE LAMINATE MEMBRANES USING SUBSTRATE OF EXAMPLE 1

The non-woven mixed glass fibre/mixed binder matrix prepared according to Example 1 was placed on a sheet of sintered PTFE and a solution of perfluorosulphonic acid (Nafion® produced by E I DuPont de Nemours) in the aqueous form as described in EP 731 520 was applied to the fibre matrix. The structure was filled with the aqueous Nafion® to achieve a total solid Nafion® loading of 7.05mg/cm^2.

A further two sheets were prepared in the same fashion. The three sheets were placed on top of each other and sandwiched between two thin, non-porous PTFE sheets. The sandwich was pressed at 90 to 100psig for six minutes at 177°C to produce a triple laminate membrane.

A 10x10cm square was cut from the bulk membrane and treated by the same procedure as described in the Comparative Examples. The results are recorded in Table 1.

EXAMPLE 5: PREPARATION OF TRIPLE LAMINATE MEMBRANES USING SUBSTRATE OF EXAMPLE 2

The non-woven silica fibre/binder matrix prepared according to Example 2 was treated according to the method and materials of Example 4 (total solid Nafion® loading of 7.24mg/cm^2) to produce a triple laminate membrane, whose results also appear in Table 1.

EXAMPLE 6: PREPARATION OF SINGLE SHEET MEMBRANES USING SUBSTRATE OF EXAMPLE 1

A single sheet of the non-woven mixed silica fibre matrix with the sprayed alcoholic Nafion® binder was formed as described in Example 1 and filled with a solution of perfluorosulphonic acid (Nafion® produced by E I DuPont de Nemours) in the aqueous form as described in EP 731 520 to achieve a total solid Nafion loading of 7.24mg/cm^2.

The sheet was sandwiched between two thin, non-porous PTFE sheets. The sandwich was pressed at 90 to 100psig for six minutes at 177°C to produce a membrane.

A 10x10cm square was cut from the bulk membrane and treated by the same procedure as described in the Comparative Examples. The results are recorded in Table 1.

EXAMPLE 7: PREPARATION OF SINGLE SHEET MEMBRANES USING SUBSTRATE OF EXAMPLE 2

The non-woven silica fibre/binder matrix prepared according to Example 2 was treated according to the method and materials of Example 6 (total solid Nafion® loading of 7.04mg/cm^2) to produce a membrane whose results also appear in Table 1.

TABLE 1

MIXED BINDER ON FIBRE NETWORKS

Example		Fibre type	Binder Type	Dimensional Changes		
				x (%)	y (%)	z (%)
CP	Nafion® 1135	N/A	N/A	+4.1	+25.0	+30.0
CP	Nafion® 115	N/A	N/A	+15.8	+20.5	+39.0
CP	Nafion® 117	N/A	N/A	+13.4	+22.5	+39.0
4	triple laminate	mixed glass fibres	1:1 colloidal silica/PTFE	+8.0	+7.0	+16.0
5	single sheet	mixed glass fibres	1:1 colloidal silica/PTFE	+2.5	+3.0	+5.6
6	triple laminate	quartz microfine fibre	1:1 colloidal silica/PTFE	+6.0	+4.0	+10.0
7	single sheet	quartz microfine fibre	1:1 colloidal silica/PTFE	0.0	0.0	0.0

PATENT COOPERATION TREATY

JES

09/807655

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

WISHART, Ian, Carmichael
Johnson Matthey Technology Centre
Blounts Court
Sonning Common
Reading RG4 9NH
GRANDE BRETAGNE

RECEIVED
24 OCT 2000

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Rule 71.1)

Date of mailing *(day/month/year)*	20.10.2000
Applicant's or agent's file reference: PFC 1432 PCT	**IMPORTANT NOTIFICATION**

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/GB99/03277	04/10/1999	16/10/1998

Applicant
JOHNSON MATTHEY PUBLIC LIMITED COMPANY et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/	Authorized officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	DA ROCHA, O. Tel.+49 89 2399-8101

Form PCT/IPEA/416 (July 1992)